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**Response to "Comment on 'Influence of random roughness on cantilever curvature sensitivity'" [Appl. Phys. Lett. 96, 226101, (2010)]**

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## Response to “Comment on ‘Influence of random roughness on cantilever curvature sensitivity’ ” [Appl. Phys. Lett. 96, 226101 (2010)]

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# Response to “Comment on ‘Influence of random roughness on cantilever curvature sensitivity’ ” [Appl. Phys. Lett. 96, 226101 (2010)]

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In our paper, we state after Eq. (5), page 041912-2 (Ref. 1) that “Fig. 1 shows the cantilever sensitivity  $T/T_0$  as a function of the local slope  $\rho_{\text{rms}}$ . In fact, Eq. (5) defines a limiting value of the local slope  $\rho_{\text{rms}}$  for which  $T=0$ , yielding  $\rho_{\text{rms}}|_{\text{max}} = \sqrt{(1-v^L)/v^L}$ . For Poisson ratios  $v^L=0.18$  [Si(111)] (Ref. 30) and  $v^L=0.28$  [Si(100)] (Ref. 30) we obtain, respectively,  $\rho_{\text{rms}/\text{max}}=2.13$  and  $\rho_{\text{rms}/\text{max}}=1.6$ . For a metallic overlayer as gold (widely used to coat cantilevers) with  $v^L=0.44$  (Ref. 30) we obtain  $\rho_{\text{rms}/\text{max}}=1.12$ . These are relatively significant values for  $\rho_{\text{rms}}$  and the perturbative expansion of Eq. (5) is valid only for local slopes  $\rho_{\text{rms}} < 1$ ....”

Therefore as we explain in our paper the validity of the approximate formula is for roughness parameters that lead to local slopes  $\rho_{\text{rms}} < 1$ . Although in a strict sense we must have  $\rho_{\text{rms}} \ll 1$ , the expansion in powers of  $\rho_{\text{rms}}^2$  multiplied by  $v^L/(1-v^L) < 1$  limits the contribution of higher order terms  $\rho_{\text{rms}}^{2n}$  ( $n > 1$ ) significantly. Around the regime  $\rho_{\text{rms}} \sim 1$  (or effectively  $\theta \sim 45^\circ$ ) one has to consider higher order terms in

$\langle \theta^2 \rangle$  in the expansion of the generic Eq. (1) in the comment [or Eq. (2) in Ref. 1]. In any case as stated in our paper, our calculations were performed for local slopes  $0 \leq \rho_{\text{rms}} < 1$  corresponding effectively to inclinations  $\theta (\approx \tan^{-1} \rho_{\text{rms}}) < 45^\circ$ . Moreover, as one can observe from Fig. 1 made from the commenting authors,<sup>2</sup> for inclinations below  $\theta < 45^\circ$  the agreement between Eq. (5) in Ref. 1 and the full calculation shown by the commenting authors<sup>2</sup> is reasonably good for both Au and Si. Therefore, for inclinations  $\theta < 45^\circ$  our analytic formula, as it is shown also by the commenting authors,<sup>2</sup> is having the correct behavior, while any discussion for angles  $\theta > 45^\circ$  is not relevant to our paper since we do not consider this regime. In any case, it came to our attention that due to error in our original publication,<sup>1</sup> Figs. 2 and 3 are not the correct ones and for this reason we have submitted an erratum.

<sup>1</sup>O. Ergincan, G. Palasantzas, and B. J. Kooi, *Appl. Phys. Lett.* **96**, 041912 (2010).

<sup>2</sup>Y. Wang, J. Weissmuller, and H. Duan, *Appl. Phys. Lett.* **96**, 226101 (2010).

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